METHODS & TECHNIQUES

Boiled Lettuce and Cress as Diet Supplements for Certain Species of Mollusks

BY

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An isolated bit of information such as this normally would be included in a more extensive biological study; however, the boiled leaf technique has produced such excellent results during the past several months it seems worthy of bringing to the attention of Veliger readers. No reference to this specific technique has been found in a hurried search of the literature (Kingston, 1966; Krull, 1937a, b). Nonetheless, it is doubtful that other workers have not chanced on this disarmingly simple, yet highly successful, means of feeding certain species of terrestrial and fresh water mollusks.

METHOD OF PREPARATION

Coarse outside leaves of romaine and head lettuce and mature large-leafed water cress, *Nasturtium officinale* R.BR., have been utilized. The unaltered plant material as whole leaves – no shredding is necessary – is immersed about 10 seconds in boiling water and then placed in cold tap water for immediate use or storage. With weekly water changes a supply of boiled cress can be kept (in water) at 40°F for several weeks. Boiled lettuce does not hold up as well and is best used within one week. Depending on the number of snails to be fed, entire or fragmented lettuce leaves can be placed with the snails in amounts dictated by experiment to be consumed in 48 hours. Boiled cress sinks and boiled lettuce floats. Consequently, the latter is brought within reach of benthic snails if it is weighted down with small rocks.

REARING CONTAINERS

In the laboratory aquatic snails are reared in 48 ounce covered plastic containers (Bay, 1967) and 5-gallon aquaria which are equipped with sub-sand filters and air bubblers. Larger numbers are reared in a greenhouse in wooden tanks measuring approximately 3 ft by 5 ft of surface by 6 inches deep with a very feeble flow-through of water, and with a layer of sand/gravel/soil on the bottom. *Succinea* is maintained in a large covered rigid plastic food container with a layer of soil which is covered with decaying grasses. In the laboratory *Helix* and *Limax* are maintained in 5-gallon aquaria with soil. A large colony of *Helix* is maintained in a lathhouse in a screen-covered pit with sides of concrete blocks.

MOLLUSKS REARED

Species which respond well to the boiled cress lettuce diet are the following:

Hydrobiidae: *Fontelicella californiensis* Gregg & Taylor seem to prefer boiled cress, but readily accept boiled lettuce. The following mollusks have been fed mainly boiled lettuce: Lymnaeidae: *Stagnicola proxima* (*palustris nuttalliana* (Lea)); Planorbidae: *Helisoma tenue californiense* F. C. Baker; Physidae: *Physa virgata* Gould, *P. gyrina* Say. Terrestrial species which readily consume this diet are: Succineidae: *Succinea californiensis* Fischer & Crosse; Limacidae: *Limax flavus* Linnaeus; Helicidae: *Helix aspersa* Müller. It is well known that *H. aspersa* feeds on raw lettuce leaves as well.

DISCUSSION

Apparently, boiling breaks down the plant tissues, thus permitting immediate feeding even by very early juvenile mollusks. In the aquaria and larger wooden culture tanks previously mentioned raw lettuce usually lies in the water for two days before newly hatched snails will touch it, and they do not swarm on it until the leaf is in a state of decay one or two days later. A cooked leaf, on the other hand, is attacked at once and may be skeletonized in 4 hours if snails are abundant. In 24 hours usually only the coarsest vascular tissue remains.

Investigation into a better snail feeding technique was prompted by the need for a constant supply of small juvenile snails which are used as hosts for first instar larvae of marsh flies (Diptera: Sciomyzidae). After a few hours in snail cultures bits of boiled lettuce or cress can be torn away with juvenile snails still attached and transferred *en masse* to the fly cultures.

An interesting side observation has been the suitability of this diet for various other fresh water invertebrates. These include, among others, Ostracoda, Amphipoda (*Gammarus* spp.), Eubranchiopoda, and planaria. These animals frequently attach themselves to the boiled plant material and it is assumed they are feeding on it.

The foregoing listing of mollusks includes all of the species, representing 7 families, that have been reared on

the boiled lettuce diet. It is hoped that this diet will find broader use and acceptance and that it will make possible the laboratory rearing of species whose biologies are now incompletely understood.

An extension of this technique might apply to the study of small cryptic terrestrial mollusks. Since it is often stated that many land mollusks are "humus feeders," the boiled leaf technique using leaves from their environment may serve as a short cut to "humus."

If close control of mollusk cultures is required, boiling of vegetation eliminates contaminants such as extraneous fungi, arthropods, mollusks, etc. This method should not be construed as a definitive, or complete, diet for mollusks, but rather as a very useful supplement to the epiphyton normally available, miscellaneous decaying or green plant material and shell building materials such as calcium carbonate, limestone or shell.

LITERATURE CITED

Bay, Ernest C.
1967. An inexpensive filter aquarium for rearing and experimenting with aquatic invertebrates. Turtox News 45 (6): 146 - 148

Kingston, Newton
1966. Observations on the laboratory rearing of terrestrial molluscs. Amer. Midland Natur. 76 (2): 528 - 532

Krull, Wendell
1937. (a) Rearing aquatic snails, pp. 523 - 526; (b) Rearing terrestrial snails, pp. 526 - 527. *In*: Culture methods for invertebrate animals. J. G. Needham, ed. Comstock Publ. Co., New York, N. Y.

NOTES & NEWS

A. M. U.

Pacific Division

The Executive Board of the American Malacological Union – Pacific Division will meet at Asilomar Conference Grounds, Pacific Grove, California on Thursday, June 20, 1968 at 1:30 p. m. The annual Business Meeting of the AMU-PD will follow immediately at 2:00 p. m. For reasons beyond the control of the elected officers it was impossible to organize any other program for the 1968 conference.

W. S. M.

The first Annual Meeting of the Western Society of Malacologists will be held at the conference grounds at Asilomar State Park, Pacific Grove, California June 19 to 22, 1968. Scientific papers, symposia on related problems, and exhibits will be presented in the various fields related to the study of malacology and invertebrate zoology.

All persons interested in malacology and conchology are cordially invited to attend, and participate in, this historic meeting. Excellent accommodations in varying price ranges (American plan) will be available for those making their reservations early.

For information on the conference or on membership in the Society, please address the Secretary, Mrs. Paul O. Hughes, 12871 Foster Road, Los Alamitos, CA 90720.

Invalid Names in Oysters

BY

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Recently 8 new names for species in the family Ostreidae (Mollusca; Bivalvia) were introduced into the literature by Gilbert Ranson (1967. Les espèces d'huitres vivant actuellement dans le monde, définies par leurs coquilles larvaires ou prodissoconques. Étude des collections de quelques-uns des grands musées d'histoire naturelle. Rev. Trav. Inst. Pêches marit., 31 (2): 127-199, figs. 1-25; (3): 205-274, figs. 26-55).

Although these so-called new species are accompanied by "illustrations" – line drawings or photomicrographs of prodissoconchs at magnifications of 200 x and above, they are not validly introduced or available since they do not satisfy Article 13 (a) of the International Code of Zoological Nomenclature (1964)' which states:

> ... a name published after 1930 must be either
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> (i) accompanied by a statement that purports to give characters differentiating the taxon; or
>
> (ii) accompanied by a definite bibliographic reference to such a statement; or